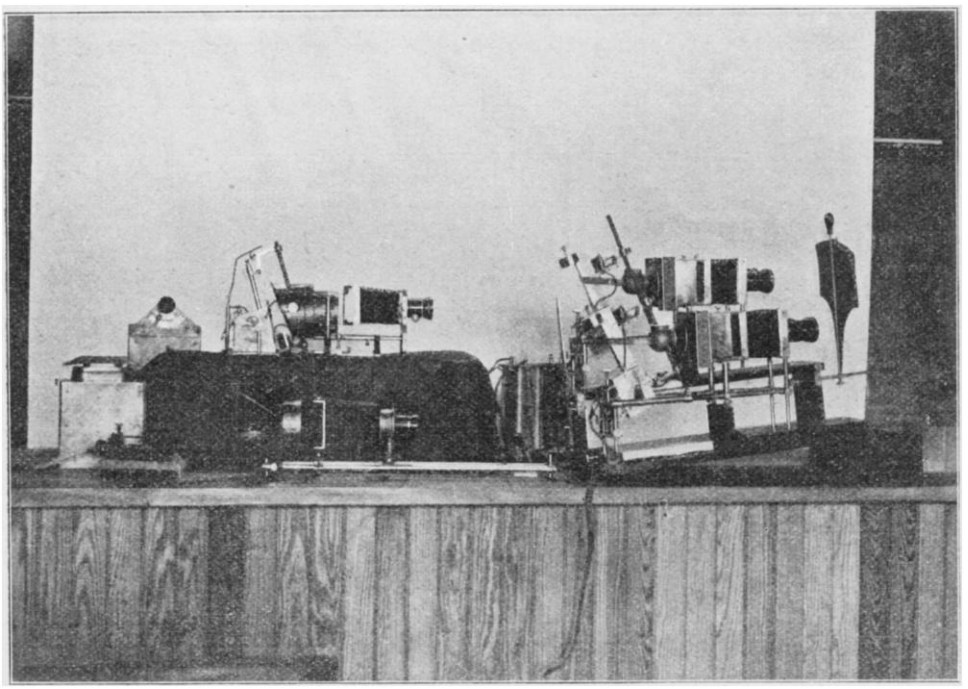
# Pedagogic Course in Physics

Charles W. Carman



### Light, Shadow, and Color

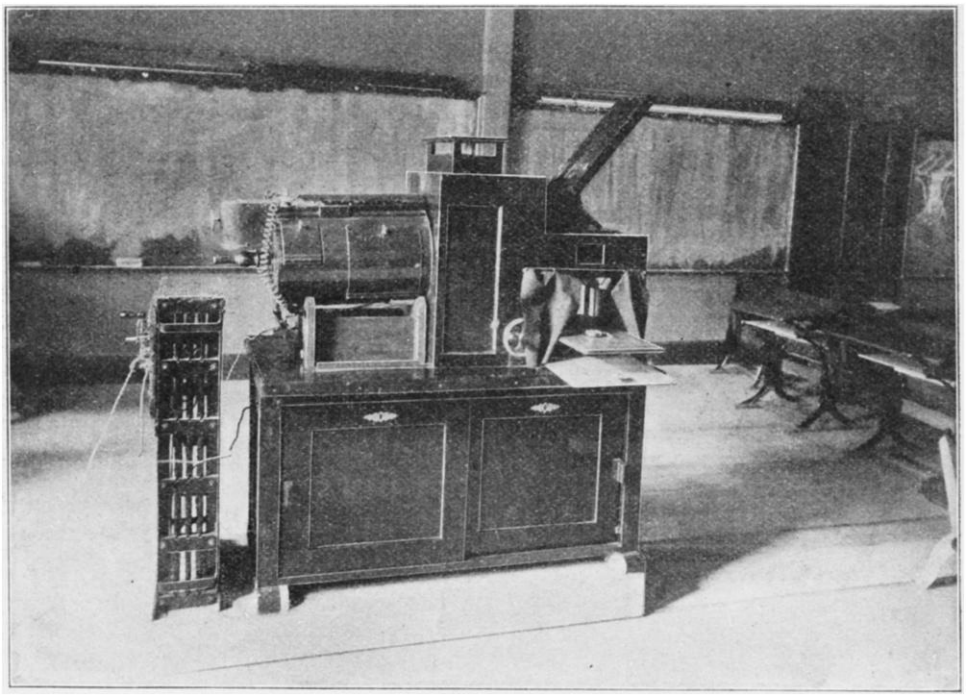
In following the outlines for the months of October and November, the principal correlation possible proved to be along the lines of "Observations in the Grades" and the study of "Physiography." That part of Physics proposed for study during the present month is susceptible of much wider correlation. It is proposed to give emphasis to the practical side of the work. The instructor will give demonstrations before the class and will require the members of the class to do the same. The class demonstrations will be upon the following topics:

Rectilinear propagation of light; images produced by small apertures; theory of shadows; images in plane mirrors; images in concave mirrors; caustics by reflection; convex spherical mirrors; the construction of a refracted ray; critical angle; total reflection; refraction through a prism; construction for deviation; images due to lenses; optical center of a lens; spherical aberration and distortion of images; dispersion; chromatic aberration; "artificial rainbows"; monochromatic light; spectra, kinds of; interference and diffraction; Newton's rings; thin films; the production of "artificial sky color"; spectra by means of diffraction gratings; Young-Helmholtz theory of primary color sensations; mixing colors; mixing pigments; composition of pigments; optical instruments, such as the achromatic lens, the

photographic camera, the eye, simple microscope, compound microscope, opera-glass, reflecting telescopes, refracting telescopes, projecting apparatus.

Nearly all of the demonstrations indicated above are shown by means of some form of projecting apparatus and a few simple accessories.

Reproductions are given from photographs, of the projecting apparatus now in the physical laboratory of the Chicago Institute.



During the month each member of the class will give demonstrations with the following forms of apparatus:

Oil, gas, and electric sciopticons; oil, gas, and electric stereopticons; helioptic-ons, and the epidiascope.

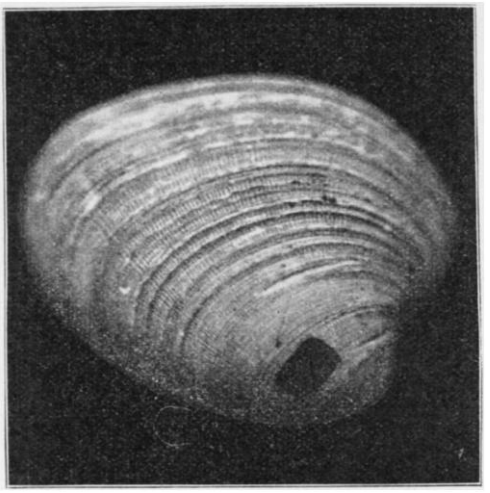
The other reproduction is from a photograph, not of the object itself, but of the projection of the object upon a screen by means of the epidiascope. Although the minute details of the structure of the shell are seen distinctly, the object photographed is nothing but an image. The shell from which the image was produced is slightly smaller than the reproduction.

The individual laboratory work will be with the radiometer; camera obscura; mirrors, plane, concave, convex; photometers; prisms; lenses; spectroscopes; diffraction gratings; the polariscope.

Each student will be furnished drawings and descriptions for the construction of a simple form of sciopticon.

The "Holmgren Test" for "color-blindness" will be made by members of the class.

Defects of vision will be tested and an effort made to measure the amount of the defect.



CORRELATION:

With Nature Study.—The light from the sun, moon, and stars ; the color of the sun and other stars; the color of sunsets; the color of the landscape, the water, and the sky ; the color of the spring and of the autumn leaves.

With Astronomy.—The composition of the stars; eclipses; telescopes.

With Mathematics.—Micrometric measurements.

With Psychology. — Relation between physical and mental images.

With Physiology. —The construction of the human eye; the optic nerve; the design and use of the ophthalmoscope.

With Art.—The absorption and reflection of light; mixing colored lights; mixing pigments; the composition of pigments; permanent colors and colors that fade.

With Home Economics.—Wall-paper and calcium colors; color as a test of food products; the color of clothing.

With Latin, Greek, French, and German. —The derivation of terms used in the study of light, such as "telescope," "microscope," "spectroscope," radiometer, stereopticon, etc.

With Manual Training.—The construction of optical apparatus.

With the Library.—References:

Elementary. — Woodhull, J. F., *First Course in Science;* Mayer and Barnard, *Light;* Hepworth, T. C., *The Book of the Lantern;* Dolbear, A. E., *The Art of Projecting;* Hall, E. H., *Lessons in Physics*, pp. 69-103; Harrington, C. L., *Physics for Grammar Schools*, pp. 93-104; Stewart, Balfour, *Physics*, pp. 89-100; Bert, Paul, *First Steps in Scientific Knowledge*, pp. 25-38; Hopkins, G. M., *Experimental Science*, pp. 200-346.

General References.—Carman, C. W., *Outlines of Physics*, pp. 128-146; Crew, H., *Elements of Physics*, pp. 292-338; Nichols, E. L., *Outlines*, pp. 370-425; Stratton, S. W., *A Laboratory Course in Physics;* Hastings and Beach, *General Physics*, pp. 599-752; Carhart, H. S., *University Physics*, pp. 226-335; Preston, T., *Theory of Light;* Tyndall, *On Light;* Vogel, *Chemistry of Light and Photography;* Tait, *Light;* Lommel, *Nature of Light.*

Lectures:

December 11, 12:00-1:00, Room 10, Dr. Henry Crew, Professor of Physics, Northwestern University, will give an experimental lecture before the class on "Some Illustrations of the Wave Theory as Found in Light, Shadow, and Color."

December 18, Professor S. W. Stratton, Associate Professor of Physics, University of Chicago, will give an experimental lecture before the class on "The Measurement of Light Waves.

Both Dr. Crew and Professor Stratton are doing research work in the subjects upon which they are to speak.